

CLAIMS

1. A device for limiting the lateral buckling of the tensile armor plies of an underwater flexible pipe that can be used in the offshore oil industry comprising, from the outside inward, at least one external polymer sheath (1), a first retention layer (2) wound around an upper tensile armor ply (3) wound in a long-pitch helix, at least one lower tensile armor ply (4) wound in a long-pitch helix and an internal polymer sheath (5), wherein at least one second retention layer (8) is wound around each lower tensile armor ply (4) and wherein the first and second retention layers have respective stiffnesses K_1 and K_2 that are defined in order to limit the swelling of the underlying armor ply.

2. The device as claimed in claim 1, wherein the first retention layer (2) has a stiffness K_1 which differs from the stiffness K_2 of said second retention layer (8).

3. The device as claimed in claim 2, wherein the stiffness K_2 of the second retention layer (8) is greater than the stiffness K_1 of the first retention layer (2).

4. The device as claimed in claim 3, wherein, upon swelling of the lowermost subassembly, a radial clearance is produced between two consecutive subassemblies, each consisting of a lower armor ply (4) and a retention layer (8), so that the subassemblies are dissociated from one another and separated by said radial clearance.

5. The device as claimed in claim 4, wherein the radial clearance is less than $0.3e$, e being the thickness of the armor wire used in the armor ply of the subassembly in question.

6. The device as claimed in one of claims 1 to 4, wherein each retention layer (2, 8) consists of several unitary elements wound around the associated armor ply, each unitary element having, along its longitudinal axis, high tensile strength and low compression strength.

7. The device as claimed in one of claims 1 to 6, wherein each unitary element of the retention layer (2, 8) is made of a woven or nonwoven aramid fiber material.

8. The device as claimed in one of claims 1 to 4, wherein the retention layers (2, 8) are made of an aramid such as the one known by the name of "Kevlar".

9. The device as claimed in claim 1, wherein the flexible pipe is of the type comprising a metal carcass (7) as innermost element.

10. The device as claimed in claim 1, wherein the flexible pipe is of the type comprising a polymer sheath (5) as innermost element.

11. The device as claimed in one of claims 5 to 7, wherein the tension in a unitary element of a retention layer is less than 50% of the tensile strength of said unitary element.

12. An underwater flexible pipe that can be used in offshore oil production comprising, from the outside inward, an external polymer sheath (1), at least two tensile armor plies, an upper (3) and a lower (4), that are wound in a long-pitch helix, a first retention layer (2) of stiffness K_1 placed around the upper tensile armor ply (3), and an internal polymer sheath (5), which flexible pipe further comprises a second retention layer (8) of stiffness K_2 placed around the lower tensile armor ply (4), wherein the first and second retention layers have respective stiffnesses K_1 and K_2 that are defined in order to limit the swelling of the underlying armor ply.